

What is Claimed is:

1. A high-density thermal recording and magnetic reading recording medium containing data written by a near-field optical laser and readable by a magneto-resistive head, comprising:
 - 5 a substrate;
 - a recording layer formed on one side of the substrate; and
 - a plurality of sub-micro cylindrical lenses formed between the substrate and the recording layer;

 wherein the near-field optical laser writes the data on the recording payer and

 - 10 generates a near-field optical effect to shrink the dimension of optical spots and increase the recording density of the recording layer, the data written on the recording layer being readable by the magneto-resistive head.
2. The high-density thermal recording and magnetic reading recording medium of claim 1, wherein the substrate is made from glass.
 - 15 3. The high density thermal recording and magnetic reading recording medium of claim 1, wherein the sub-micro cylindrical lenses have an effective numerical aperture greater than 1.1.
 4. The high-density thermal recording and magnetic reading recording medium of claim 3, wherein the sub-micro cylindrical lenses are solid immersion lenses.
 - 20 5. The high-density thermal recording and magnetic reading recording medium of claim 4, wherein the sub-micro cylindrical lenses are made from a material selecting from a group consisting of ZnS 、SiO₂ and SiNx.
 6. The high-density thermal recording and magnetic reading recording medium of claim 1, wherein the recording layer is a magnetic recording film.

7. The high-density thermal recording and magnetic reading recording medium of claim 6, wherein the magnetic recording film has a reading layer located thereon.
8. The high-density thermal recording and magnetic reading recording medium of claim 1, wherein the recording layer is a magnetic optical recording layer.
- 5 9. The high density thermal recording and magnetic reading recording medium of claim 8, wherein the magnetic optical recording layer has a reading layer located thereon.
10. The high density thermal recording and magnetic reading recording medium of claim 1, wherein the recording layer is magnetized in a direction normal to the surface of the recording layer.
- 10 11. A high density thermal recording and magnetic reading system, comprising:
- a recording medium which includes a substrate, a recording layer formed on the substrate and a plurality of sub-micro cylindrical lenses formed between the substrate and the recording layer;
- a near-field optical laser located on one side of the recording medium for
- 15 recording data on the recording layer and generating a near-field optical effect to shrink the dimension of optical spots to increase the recording density of the recording layer; and
- a magneto-resistive head located on another side of the recording layer to read the data written on the recording layer.
- 20 12. The high-density thermal recording and magnetic reading system of claim 11, wherein the substrate is made from glass.
13. The high-density thermal recording and magnetic reading system of claim 11, wherein the sub-micro cylindrical lenses have an effective numerical aperture greater than 1.1.

- 14.The high-density thermal recording and magnetic reading system of claim 13,
wherein the sub-micro cylindrical lenses are solid immersion lenses.
15. The high-density thermal recording and magnetic reading system of claim 14,
wherein the sub-micro cylindrical lenses are made from a material selecting from a
5 group consisting of ZnS 、SiO₂ and SiNx.
- 16.The high-density thermal recording and magnetic reading system of claim 11,
wherein the recording layer is a magnetic recording film.
- 17.The high-density thermal recording and magnetic reading system of claim 16,
wherein the magnetic recording film has a reading layer located thereon.
- 10 18.The high-density thermal recording and magnetic reading system of claim 11,
wherein the recording layer is a magnetic optical recording layer.
- 19.The high-density thermal recording and magnetic reading system of claim 18,
wherein the magnetic optical recording layer has a reading layer located thereon.
- 20.The high-density thermal recording and magnetic reading system of claim 11,
15 wherein the recording layer is magnetized in a direction normal to the surface of the
recording layer.
- 21.The high-density thermal recording and magnetic reading system of claim 11,
wherein the magneto-resistive head is selectively a giant magneto-resistive head or a
tunneling magneto-resistance head.